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<110> NUTALL, PATRICIA
OXFORD VACS LTD
PARSON, GUIDO CHRISTIAN

<120> HISTAMINE AND SEROTONIN BINDING MOLECULES

<130> Oxford Vacs - Histamine and Serotonin

<140> US 09/555 296

<141> 2000-09-13

<160> 31

<170> PatentIn Ver. 2.1

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<212> PRT

<213> Rhipicephalus appendiculatus

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Gln Asp Ala Trp Lys His Leu Gln Lys Leu Val Glu Glu Asn Tyr Asp
35 40 45

Leu Ile Lys Ala Thr Tyr Lys Asn Asp Pro Val Trp Gly Asn Asp Phe
50 55 60

Thr Cys Val Gly Thr Ala Ala Gln Asn Leu Asn Glu Asp Glu Lys Asn
65 70 75 80

Val Glu Ala Trp Phe Met Phe Met Asn Asn Ala Asp Thr Val Tyr Gln
85 90 95

His Thr Phe Glu Lys Ala Thr Pro Asp Lys Met Tyr Gly Tyr Asn Lys
100 105 110

Glu Asn Ala Leu Thr Tyr Gln Thr Glu Asp Gly Gln Val Leu Thr Asp
115 120 125

Val Leu Ala Phe Ser Asp Asp Asn Cys Tyr Val Ile Tyr Ala Leu Gly
130 135 140

Pro Asp Gly Ser Gly Ala Gly Tyr Glu Leu Trp Ala Thr Asp Tyr Thr
145 150 155 160

Asp Val Pro Ala Ser Cys Leu Glu Lys Phe Asn Glu Tyr Ala Ala Gly
165 170 175

TECH CENTER 1600/2900

MAR 14 2002

RECEIVED

Leu Pro Val Pro Asp Val Tyr Thr Ser Asp Cys Leu Pro Glu
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<213> Rhipicephalus appendiculatus

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His Gln Asp Ala Trp Lys Ser Leu Lys Ala Asp Val Glu Asn Val Tyr
35 40 45

Tyr Met Val Lys Ala Thr Tyr Lys Asn Asp Pro Val Trp Gly Asn Asp
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Phe Thr Cys Val Gly Val Met Ala Asn Asp Val Asn Glu Asp Glu Lys
65 70 75 80

Ser Ile Gln Ala Glu Phe Leu Phe Met Asn Asn Ala Asp Thr Asn Met
85 90 95

Gln Phe Ala Thr Glu Lys Val Thr Ala Val Lys Met Tyr Gly Tyr Asn
100 105 110

Arg Glu Asn Ala Phe Arg Tyr Glu Thr Glu Asp Gly Gln Val Phe Thr
115 120 125

Asp Val Ile Ala Tyr Ser Asp Asp Asn Cys Asp Val Ile Tyr Val Pro
130 135 140

Gly Thr Asp Gly Asn Glu Glu Cys Tyr Glu Leu Trp Thr Thr Asp Tyr
145 150 155 160

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165 170 175

Gly Arg Glu Thr Arg Asp Val Phe Thr Ser Ala Cys Leu Glu
180 185 190

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<213> Rhipicephalus appendiculatus

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Thr	Ile	Leu	Tyr	Lys	Asn	Lys	His	Leu	Thr	Asp	Leu	Lys	Glu	Ser	His
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Glu	Thr	Ile	Thr	Val	Trp	Lys	Ala	Tyr	Asp	Tyr	Thr	Thr	Glu	Asn	Gly
			100					105					110		
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	115					120						125			
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Lys	Ile	Asp	Lys	Ile	Pro	Asp	Cys	Cys	Lys	Phe	Thr	Met	Ala	Tyr	Phe
			165						170					175	
Ala	Gln	Gln	Gln	Glu	Lys	Thr	Val	Arg	Asn	Val	Tyr	Thr	Asp	Ser	Ser
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Gln Glu Ile Glu Arg Lys Glu Glu Asp Tyr Thr Val Thr Ser Val Phe
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Thr Phe Arg Asn Ala Ser Ser Pro Ile Lys Tyr Tyr Asn Val Thr Glu
100 105 110

Thr Val Lys Ala Val Phe Gln Tyr Gly Tyr Lys Asn Ile Arg Asn Ala
115 120 125

Ile Glu Tyr Gln Val Gly Gly Gly Leu Asn Ile Thr Asp Thr Leu Ile
130 135 140

Phe Thr Asp Gly Glu Leu Cys Asp Val Phe Tyr Val Pro Asn Ala Asp
145 150 155 160

Gln Gly Cys Glu Leu Trp Val Lys Lys Ser His Tyr Lys His Val Pro
165 170 175

Asp Tyr Cys Thr Phe Val Phe Asn Val Phe Cys Ala Lys Asp Arg Lys
180 185 190

Thr Tyr Asp Ile Phe Asn Glu Glu Cys Val Tyr Asn Gly Glu Pro Trp
195 200 205

Leu

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<213> Rhipicephalus appendiculatus

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35 40 45

Thr Phe Gln Thr Pro Asn Ser Asp Asp Thr Lys Cys Leu Ser Ser Thr
50 55 60

Ile Asp Gly Lys Asn Glu Asn Asn His Thr Val Gln Ala Thr Ile Arg
65 70 75 80

Tyr Arg Asn Gly Tyr Glu Gly Lys Trp Asp Thr Ile Arg Gln Glu Tyr
85 90 95

Glu Phe Pro Asn Tyr Thr Ala Gly Asp Tyr Asn Ser Met Lys Thr Thr
100 105 110

Asp Lys Ser Pro Pro Pro Pro Ala Ser Tyr Leu Phe Gly Tyr Thr Gly
115 120 125

Ser Ser Cys Ala Val Val Tyr Val Asn Ser Ile Gly Pro Val Arg Ser
130 135 140

Asn Ser Glu Asn Pro Pro Glu Arg Leu Thr Ala Ser Gln Glu Ser Ala
145 150 155 160

Gln Arg Asp Cys Val Leu Trp Val Asp His Asp Glu Lys Ala Thr Gln
165 170 175

Glu Gln Cys Cys Glu Asp Phe Phe Lys Thr His Cys Lys Glu Thr Val
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His Val Ile Tyr Asp Val Asn Arg Cys Lys Glu Asn Gly Ser Glu
195 200 205

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<213> Boophilus microplus

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Thr Val Ala Phe Met Ile Pro Thr Trp Ala Asp Glu Gly Arg Phe Gly
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Lys Tyr Gln Asn Ala Trp Lys Ala Leu Asn Gln Arg Ile Asn Thr Thr
35 40 45

His Val Leu Val Arg Ser Thr Tyr Ile Asp Asn Pro Tyr Leu Trp Gly
50 55 60

Lys Asn Phe Ser Cys Val Arg Ala Arg Thr Val Glu Val Phe Pro Ser
65 70 75 80

Ser Lys Thr Val Glu Leu Glu Phe Ser Phe Arg Asn Arg Thr Gly Ile
85 90 95

Leu Cys Met Arg Asn Gln Thr Val Arg Ala Gly Lys Asp Tyr Phe Tyr
100 105 110

His Gln Pro Asn Ala Phe Glu Phe Met Leu Arg Gly Asn Arg Ser Phe
115 120 125

Ser Asn Ala Val Met Phe Thr Asp Gly Met Thr Cys Asn Leu Leu Ser
130 135 140

Phe Pro Tyr Gln Arg Asn Lys Pro Gln Cys Glu Leu Trp Val Lys Asp
145 150 155 160

Thr Arg Val Asp Asn Ile Pro Pro Cys Cys Ser Phe Met Phe Asp Tyr
165 170 175

Leu Cys Pro Gln Pro Arg Pro Phe Ile Ile Tyr Asp Lys Ala Met Cys
180 185 190

Thr Val Arg Pro Pro Arg
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20 25 30

Thr Thr Trp His Ser Lys Glu Leu Lys Asn Tyr Gln Asp Ala Trp Lys
35 40 45

Ser Ile Asn Gln Asn Val Ser Thr Thr Tyr Tyr Phe Leu Arg Ser Thr
50 55 60

Tyr Asn Asn Asp Ser Val Trp Gly Lys Asn Phe Thr Cys Leu Ser Val
65 70 75 80

Thr Val Thr Ser Lys His Glu Ser Thr Phe Thr Val Glu Tyr Asn Thr
85 90 95

Thr Tyr Lys Asn Gln Ser Gln Gln Trp Val Ser Met Thr Glu Asn Val
100 105 110

Thr Ala Val Gln Glu Glu Gly Tyr Asp Val Lys Asn Ile Ile Gln Trp
115 120 125

Thr Thr Glu Asn Asn Thr Lys Phe Asn Asp Thr Val Val Phe Thr Asp
130 135 140

Gly Gln Thr Cys Asp Leu Leu Tyr Ile Pro Tyr Lys Glu Asn Gly Tyr
145 150 155 160

Glu Leu Trp Val Arg Ser Asp Tyr Leu Gln Asn Thr Pro Thr Cys Cys
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Gln Phe Ile Phe Asp Leu Val Ala Leu Gly Arg Thr Thr Tyr Asn Ile
180 185 190

Ser Thr Pro Asp Cys Val Thr Lys Thr Ser Arg
195 200

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<213> Boophilus microplus

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Met Lys Ala Leu Leu Ile Ala Val Val Tyr Leu Thr Ala Val Thr Ala
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Thr Thr Trp His Asn Gln Thr Leu Gly Arg Tyr Gln Asp Ala Trp Lys
35 40 45

Ser Ile Asn Gln Ser Val Gly Thr Thr Tyr Tyr Phe Leu Arg Ser Thr
50 55 60

Tyr Asn Asn Asp Ser Val Trp Gly Lys Asn Phe Thr Cys Leu Ser Val
65 70 75 80

Thr Val Thr Ser Lys Tyr Glu Ser Thr Phe Thr Val Glu Tyr Asn Thr
85 90 95

Thr Tyr Lys Asn Gln Ser Gln Gln Trp Val Ser Met Ser Glu Asn Val
100 105 110

Thr Ala Val Gln Glu Gly Gly Tyr Ser Val Lys Asn Ile Ile Gln Trp
115 120 125

Thr Thr Glu Asn Asn Thr Lys Phe Asn Asp Thr Val Val Phe Thr Asp
130 135 140

Gly Gln Thr Cys Asp Val Leu Tyr Ile Pro Tyr Lys Glu Asp Gly Tyr
145 150 155 160

Glu Leu Trp Val Arg Ser Glu Tyr Leu Gln Asn Thr Pro Thr Cys Cys
165 170 175

Gln Phe Ile Phe Asp Leu Val Ala Leu Gly Arg Thr Thr Tyr Asn Ile
180 185 190

Ser Thr Pro Asn Cys Val Ala Thr Thr Ala Gly
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<213> Boophilus microplus

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20 25 30

Met Asn Thr Gln Arg Leu Gly Lys Met Gln Asp Ala Trp Lys Ser Leu
35 40 45

Glu Lys Ala Thr Asn Gln Ser Tyr Val Leu Val Phe Arg Ser Arg Asn
50 55 60

His Glu Pro Glu Ile Ser Cys Val Tyr Val Arg Ala Ser Asn Ile Asn
65 70 75 80

Asn Asp Thr Lys Thr Ala Thr Tyr Thr Arg Thr Tyr Tyr Asn Met Thr
85 90 95

Ala Asn Ala Thr Met Thr Val Asn Tyr Thr Ala Arg Ala Leu Lys Gln
100 105 110

Val Asp Tyr Glu Ser Glu Asn Val Val Arg Val Asn Leu Thr Gly Gly
115 120 125

Val Pro Ser Asn Asp Thr Val Pro Leu Gly Ser Tyr Glu Tyr Val Glu
130 135 140

Tyr Gly Asn Tyr Ser Cys Asn Ser Ser Ser Thr Pro Phe Leu Asp Ala
145 150 155 160

Val Gln Met Ala Ser Gln Gly Gln Ser Arg Gly Pro Asp Ile Glu Gly
165 170 175

Arg Thr Tyr Leu Asp Phe Tyr Val Val Tyr Asn Gln Pro Ser Cys Asn
180 185 190

Val Leu Lys Ser Pro Leu Leu Gly Gly Ala Cys Asp Phe Trp Val Thr
195 200 205

Glu Ser Glu Leu Gln Lys Ala Leu Asn Lys Thr Ser Glu Lys Lys Lys
210 215 220

Thr Lys Leu Glu Ala Arg Ala Arg Lys Ala Gly Gly Asp Ser Asp Asp
225 230 235 240

Gln Gly Pro Glu Leu Glu Val Val Phe Lys Asn Leu Pro Pro Pro Cys
245 250 255

Arg Ala Ala Phe Ile Thr Ser Cys Gly Tyr Pro Thr Phe Leu Met Tyr
260 265 270

Asn Lys Thr Ile Cys Asn Arg Thr Asp Ser Ala Ala Val
275 280 285

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<213> Boophilus microplus

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Met	Asn	Thr	Gln	Arg	Leu	Gly	Lys	Met	Gln	Asp	Ala	Trp	Lys	Ser	Leu	
35					40					45						
Glu	Lys	Ala	Ala	Asn	Gln	Thr	Tyr	Val	Leu	Val	Phe	Arg	Ser	Arg	Asn	
50					55					60						
His	Glu	Pro	Asp	Ile	Ser	Cys	Val	Tyr	Val	Arg	Ala	Ser	Asn	Leu	Asp	
65					70					75					80	
Asn	Ala	Thr	Lys	Thr	Ala	Asp	Tyr	Thr	Arg	Thr	Tyr	Tyr	Asn	Met	Thr	
85					90					95						
Ala	Lys	Gln	Asn	Val	Ser	Val	Asn	Tyr	Thr	Ala	Arg	Ala	Leu	Lys	Gln	
100					105					110						
Val	Asp	Tyr	Glu	Ser	Glu	Asn	Val	Val	Arg	Val	Asn	Leu	Thr	Gly	Gly	
115					120					125						
Val	Pro	Ser	Asn	Asp	Thr	Val	Pro	Pro	Gly	Ser	Phe	Glu	Tyr	Val	Glu	
130					135					140						
Tyr	Gly	Asn	Tyr	Ser	Cys	Asn	Ser	Ser	Ser	Thr	Pro	Phe	Leu	Asp	Ala	
145					150					155					160	
Val	Gln	Met	Ala	Ser	Gln	Gly	Gln	Ser	Trp	Gly	Pro	Asp	Val	Glu	Gly	
165					170					175						
Arg	Thr	Tyr	Leu	Asp	Phe	Tyr	Val	Val	Tyr	Asn	Gln	Pro	Ser	Cys	Asn	
180					185					190						
Val	Leu	Lys	Ser	Pro	Leu	Leu	Gly	Gly	Ala	Cys	Asp	Phe	Trp	Val	Pro	
195					200					205						
Gln	Ser	Glu	Leu	Asp	Lys	Val	Leu	Asn	Lys	Lys	Gly	Asp	Lys	Lys	Lys	
210					215					220						
Pro	Ala	Lys	Ser	Ser	Ser	Gln	Asn	Gly	Asp	Glu	Gly	Ser	Asp	Ala	Glu	
225					230					235					240	
Gln	Pro	Glu	Leu	Glu	Ala	Ile	Phe	Lys	His	Leu	Pro	Pro	Pro	Cys	Arg	
245					250					255						
Ala	Ala	Phe	Ile	Thr	Ser	Cys	Gly	Tyr	Pro	Asn	Phe	Leu	Met	Tyr	Asn	
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 <213> Boophilus microplus

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Asn	Ser	Pro	Leu	Leu	Asn	Asn	Gln	His	Leu	Gly	Leu	Phe	Gln	Asp	Ala	35	40	45	
Trp	Lys	Thr	Ile	Glu	Glu	Thr	Ser	Asn	Asp	Thr	Tyr	Val	Leu	Met	Phe	50	55	60	
Arg	Ser	Lys	His	Tyr	Asp	His	Glu	Asn	Lys	Ala	Lys	Cys	Val	Phe	Val	65	70	75	80
Thr	Ala	Asn	Ile	Thr	Asp	Ser	Arg	Asn	Lys	Thr	Ala	Asn	Tyr	Thr	Ile	85	90	95	
Thr	Tyr	Tyr	Asp	Thr	Thr	Thr	Asn	Thr	Ser	Asn	Asn	Phe	Thr	Ile	Pro	100	105	110	
Val	Arg	Ala	Leu	Asn	Gln	Thr	Asp	Tyr	Ser	Leu	Glu	Asn	Val	Ile	Arg	115	120	125	
Ala	Ser	Phe	Asn	Gly	Asp	Thr	Pro	Ser	Ser	Thr	Pro	Ala	Pro	Pro	Gly	130	135	140	
Ser	Ser	Val	Tyr	Ile	Gln	Tyr	Asn	Asn	Val	Thr	Cys	Tyr	Ala	Gln	Tyr	145	150	155	160
His	Pro	Phe	Ser	Asn	Asn	Gly	Ile	Ser	Ala	Lys	Tyr	Asp	Glu	Met	Pro	165	170	175	
Arg	Asp	Gly	Arg	Asn	Tyr	Leu	Phe	Asp	Asn	Phe	Ile	Gly	Ala	Tyr	Leu	180	185	190	
Asp	Phe	Tyr	Val	Val	Phe	Ser	Gln	Pro	Thr	Cys	Asn	Val	Leu	Arg	Val	195	200	205	
Arg	Glu	Gly	Cys	Asp	Phe	Trp	Leu	Arg	Lys	Thr	Glu	Leu	Pro	Ser	Leu	210	215	220	
Leu	Lys	Ala	Ala	Glu	Asn	Asp	Asp	Asn	Asp	Asn	Thr	Glu	Ser	Leu	Lys	225	230	235	240
Asn	Tyr	Trp	Glu	Arg	Arg	Ile	Asn	Asn	Thr	Lys	Thr	Arg	Phe	Arg	His	245	250	255	
Asn	Thr	Lys	Lys	Cys	Lys	Met	Tyr	Val	Gln	Arg	Tyr	Ser	Ile	Glu	Lys	260	265	270	
Ala	Glu	Asp	Val	Phe	Lys	Asn	Thr	Ala	Phe	Lys	His	Leu	Pro	Ser	Asp	275	280	285	
Cys	Arg	Phe	Ala	Phe	Leu	Ala	Ala	Cys	Gly	Asn	Pro	Ala	Phe	Thr	Ile	290	295	300	

Tyr Asp Pro Glu Thr Cys Asn Ser Ser Leu Pro Ala Asn Met Ala Glu
 305 310 315 320

Ser

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 agcatctcca aaaactcgtt gaagagaatt acgacttgat aaaagccacc tacaagaacg 180
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 atacttttga aaaggcgact cctgataaaa tgtacgggta caataaggaa aacgccatca 360
 catatcaaac agaggatggg caacttctca cagacgtcct tgcattctct gacgacaatt 420
 gctatgtcat ctacgtctct ggcccagatg gaagtggagc aggttacgaa ctctgggcta 480
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 tgccggtagc ggacgtatac acaagtgtat gcctcccaga ataacttggg catatcgtaa 600
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 gatgatgcc a ttcacttagg tttcgggtgt tcggtacttt atgctcactg ccgacggcca 720
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 acaataggga aaacgccttc agatacgaga cggaggatgg ccaagttttc acagacgtca 420
 ttgcatactc tgatgacaac tgcgatgtca tctacgttcc tggcacagac ggaaatgagg 480
 aaggttacga actatggact acggattacg acaacattcc agccaattct ttaaataagt 540
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 aataacttca gaatgtcgtt ctttcaaagc gaaaaaccaa caatgtgaac atcggcttgc 660
 tgtgctcgac gttagccagc ataatgttgt tttcctgggt ttctgggttt ggatactttt 720
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aaacttaacg ctacgaccc ctataaaaat aagcacctta ctgacctgaa agagagtcac 300
gaaacaatca ctgtctggaa agcatacgac tacacaacgg agaattggcat caagtacgag 360
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gcccacacgc aggagaagac gggtcgtaat gtatacactg actcatcatg caaaccagca 600
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caagaatag aaagaaagga agaagactat acagttacat ctgttttcac ctttagaaat 300
gcgtcttctc caatcaagta ttacaacgtg acagaaacag tgaaggccgt ttttcaatat 360
ggatacaaaa acataaggaa tgcaattgaa taccagtgg gcggtggact taacataacc 420
gacacgtcca ttttactga tggagaatta tgcgatgttt tctatgttcc caatgcagat 480
caaggttctg agctctgggt caaaaagagt cactacaaac acgtaccaga ctactgcacg 540
ttcgtgttca atgttttctg tgcgaaagac aggaaaacct acgatataat taatgaagaa 600
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tttctcaaga aaggcaagag atacgatatg aaacagagaa ctttccaaac acctaactca 180
gacgacacta aatgcctgtc cagtactatc gacggaagaa atgaaaataa ccatacagta 240
caagcaacga taagatatcg aaatgggtat gaaggaaaat gggacaccat ccgccaggag 300
tacgagttcc ccaactacac tgcaggagac tacaactcca tgaagacaac agacaaatcc 360
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gtgaattcca ttggacctgt tcgtagcaat tctgaaaacc caccagaaag actcacagca 480
agtcaggaaa gtgcacaacg cgattgcgtc ctttgggtcg atcacgatga aaaagctacc 540
caagaacaat gctgtgaaga tttcttcaag acccactgca aagagactgt ccattgcata 600
tacgacgtga atagatgcaa ggagaatggc agtgaataac acgatgccgg gaatggcatg 660
gcgacttcat ttatgaagga agacttccac agatgtgaaa cttgccttca ttttgcctgt 720
tacttttagac caacatatcc ttccttttcc gacttcaatg atatgatcta ggttgtaaaa 780
agagcgtttt aataaagaaa gtattagcat cgatgatgga aatataaaaa aa 832

```

<210> 17
 <211> 1488

<212> DNA

<213> *Amblyomma variegatum*

<400> 17

```
gcgaccgcgc ccagccgtac agaacaata gccttcgttg caaacgtgca gcgtagtcgg 60
atgcctagtt aaacaccaca cacacgtaaa aagtagacga aactggcttc gcttccagca 120
ccaagcaggt catcgtctgg tccactgacg atgaactctg ccttggtggg tttactagga 180
tcatccttat ggctgcatac ggtagcggtc atgattccca catgggcaga tgaaggcagg 240
tttggaagt accagaacgc ctggaaggcc ctgaatcagc ggattaacac aacacatgtc 300
cttgtgaggt caacgtatat cgacaatcca tatttatggg gcaagaactt ctcatgcgta 360
cgcgtcga aa ctgctgaagt ctttccagc agcaagactg tggaaactgga gtttagtttc 420
agaaacagga ctggtatatt gtgcatgaga aatcaaacgg ttcgagctgg aaaggattac 480
ttttatcatc agcctaacgc cttcgaattc atgctgagag gtaacaggtc gttttctaac 540
gctgtcatgt ttaccgacgg aatgacatgt aatctgctca gctttccata ccagcgcaac 600
aaaccacaat gcgaactatg ggtgaaggac acgcgcgtcg acaacattcc cccttggtgc 660
tcgttcatgt tcgactattt gtgcccacag cctcgtccat tcatcattta cgacaaagca 720
atgtgcacgg tgaggccacc ccgctagaaa gaaaagggat gaaaaggcta ctcgaagaag 780
caacaaccaa tcagtgccca caagagaacc gttccagtc tgcgaaagtt gcgcctccca 840
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catattttat cttcgtgctg tgtttgtcgc agtatatttt tctgcctatt cacgatattt 1440
gcacaatgta ataaacatt tgctgccta aaaaaaaaaa aaaaaaaaaa 1488
```

<210> 18

<211> 760

<212> DNA

<213> *Boophilus microplus*

<400> 18

```
ctccagctct gcttcgacga tgaaggctct cctgatcgct gtcggctacc tggctgccgt 60
cacagcggca ccccaagctt cgccttcctc tccgaggaa gaaccactca agaatactac 120
gtggcacagc aaggaaactga aaaattatca agatgcgtgg aagtccatca atcaaaacgt 180
cagcactacc tactacttcc tcagatcaac ctacaacaac gacagtgtct ggggtaaaaa 240
tttcacctgt cttagcgtca cggtgacatc gaaacatgaa tcaacgttca ccgtcgaata 300
taacaccacg taaaaaatc agagccaaca atgggtcagc atgacggaaa acgtcacggc 360
cgtgcaggag gagggtacg acgttaaaaa tatcattcag tggacaacag agaataacac 420
aaagttcaat gatactgttg tttttacgga cggccagact tgtgatctgt tgtacatccc 480
gtacaaaagaa aacggttacg agctgtgggt gcgttcggat tacctgcaga acactccaac 540
gtgctgccag ttcattcttg acctcgtcgc attgggacgt accacgtaca atatctccac 600
tcctgactgc gtgacaaaaa cctctcgtta gaccgtgaaa gccgcggctt atgctactcg 660
actgctcagg ttggaagagt agggagcccc gacgcgcact actactaaaa atgattccaa 720
ataaagtatt caaacatttc aaaaaaaaaa aaaaaaaaaa 760
```

<210> 19

<211> 765

<212> DNA

<213> *Boophilus microplus*

<400> 19

```
agtgactcct gctctgcttc gacgatgaag gctctcctga tcgctgtcgt ctacctgact 60
```

```

gccgtcacag cggcagacca agctccgcct tctctacga ggaatgaacc actcgagaaa 120
actacctggc acaaccagac actgggacgt tatcaagatg cgtggaagtc catcaatcaa 180
agcgtcggca ctacctacta cttctcaga tcaacctaca acaacgacag cgtgtgggg 240
aaaaatttca cctgtcttag cgtcacggtg acatcgaaat atgaatcaac gttcaccgtc 300
gaatataaca ccacgtacaa aaatcagagc caacaatggg tcagcatgtc ggaaaacgtc 360
acggccgtgc aggagggcgg ctacagtgtt aaaaacatca ttcagtggac aacggagaat 420
aacacaaagt tcaatgatac tgttgtttt acggacggcc agacttgtga tgtgttatac 480
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ccaacgtgct gccagtcat ctttgacctc gtcgcatggg gacgtaccac gtacaatata 600
tccactccta actgcgtggc caccaccgct ggtagacaa tgcaagccgc ggcttaattt 660
actcgaccgc tcaggttggg agtgccggga gcctcgacgg gcactactac ttaaaatgat 720
ttcgaataaa gtattcaagc atttctggaa aaaaaaaaaa aaaaaa 765

```

<210> 20
 <211> 1046
 <212> DNA
 <213> *Boophilus microplus*

```

<400> 20
gatggcgctc agatttgcac ttctgctggc gtgcatcgtc acggcatgtg gctggagaac 60
acggatttca gagaaaggtc ccgagaacaa cctctcatg aacacccaac gtttgggaaa 120
aatgcaagac gcatggaaga gtctggaaaa ggcaacaaat cagtcgtatg tcttgggtgtt 180
ccgtcaaga aatcacgaac cagagatata ctgctgttac gtgagggcta gtaatatata 240
taatgacact aaaactgcaa cttataccag aacatattac aatatgacgg caaacgcaac 300
catgacggtg aattatactg caagagctct gaagcaagtg gactatgagt cggaaaatgt 360
cgtacgagta aacctgacag gtgggggtccc cagcaacgat acagtccctc ttggaagcta 420
cgaatacgtc gactacggta attactcctg caatagctca tcgacaccct ttttggatgc 480
tgtgcaaatg gcatcgcaag ggcaatccag agggccggat atcgaagggc gcacatatct 540
agacttctac gtctgttaca atcaaccatc gtgcaatgtc ctgaagtccc cgctcctggg 600
agggtgcttg gacttttggg tgacagaatc cgagttgcaa aaagcactaa ataagacatc 660
agagaagaaa aaaacaaagc tagaagcgag agcaaggaaa gctggaggag attccgatga 720
ccagggacct gaactggagg tcgtcttcaa aaatctgccc cctccctgcc gcgcagcgtt 780
cataacttcc tgcggctatc caacttttct tatgtacaac aagaccatct gtaatcgaac 840
ggattctgct gcggtgtgaa cgtccccctg gagcaagtag aacgtccgtg aagacagcag 900
gaagatagat gactgttttg ttggcggaat gtgactacta gtctgaatca ttaaaaagat 960
tcngctgacg ggtgtggcgg gaactttttt aaatgaaatt ggtcatactt gttgaaagac 1020
aaaaataaaa caatatgtta ctcttc 1046

```

<210> 21
 <211> 1025
 <212> DNA
 <213> *Boophilus microplus*

```

<400> 21
ggaaaccagg atggcgctca gatttgcact tctgctggcg tgcacgtca cggcatgtgg 60
ctggagaaca cggattcaag agaaagggtc cgagaacaac cctctcatga acacccaacg 120
tttgggaaaa atgcaagacg catggaagag tctggaaaaa gcagcaaatc agacgtatgt 180
cttgggtgtc cgtcaagaa atcacgaacc agatatatcc tgcgtctacg tgagagctag 240
taatttagat aatgcaacta aaactgcaga ttataccaga acatattaca atatgacggc 300
aaaacaaaaa gtgtcggtta attatactgc aagagctctg aagcaagtgg actatgagtc 360
ggaaaatgtc gtacgagtaa acctgacagg tgggggtccc agtaacgata cagtccctcc 420
tggaagcttc gaatacgtcg agtacggtaa ttactcctgc aatagctcat cgacaccctt 480
tttggatgct gtgcaaatgg catcgcaagg gcaatcctgg gggccggatg tcgaagggcg 540
cacatatcta gatttctacg tcgtctacaa tcaaccgtcg tgcaatgtcc tgaagtcccc 600
gctcctggga ggtgcttgtg acttctgggt gccacaatca gagttggaca aggtactaaa 660
caaaaaagga gataagaaaa agccagctaa gtcaagcagt caaaatggag acgaagggtc 720
tgatgccgag caacctgaac tggaggccat ctttaaacat ctacccctc cctgccgcgc 780

```

```

agcgttcata acttcctgcg gctatccaaa ttttctcatg tacaacaaga cgatctgtaa 840
tgcagcgggt catgctgcga actgaacgtc ctctgcgaac gagtagagcg tgcgtaaaaa 900
caactggctct gaatctttta agaaattcgg caaagtgcgg gtggcgcgaa cttttatcaa 960
actggtcata catgtgaaag aaaaaataa aacaaaatgt gcataaaaaa aaaaaaaaaa 1020
aaaaa 1025

```

```

<210> 22
<211> 1156
<212> DNA
<213> Boophilus microplus

```

```

<400> 22
cgaagagcag gtacgattcg aatcttttga atggacattc gcagcgcgtgt tttgttcgcg 60
tgcacgtctc cggcgtgttg tggcttttgg cgctggacaa cacggagggt aactaaaaag 120
cctgataaca gccctctgtt gaacaaccaa catcttggtc ttttccagga cgcattggaag 180
actatagaag agacgtccaa tgatacgtat gtcttgatgt tccgctcaaa acattacgac 240
cacgagaaca aggctaaatg tgtcttcgta acggcaaata ttactgactc ccggaacaaa 300
actgccattt acacaataac gtattacgat actacaacaa atacatccaa caattttaca 360
atcccagtga gagctctgaa ccaaactgac tactcactag aaaaatgtgat tgcagcaagc 420
ttcaacggcg aactccaaag ctctactcca gcccctcccg gaagcagcgt gtacattcag 480
tataataatg ttacctgcta cgccaatat caccattttt caaataatgg aatcagtgca 540
aaatatgatg aaatgccccg ggatggcoga aattacttgt tgcacaattt tattggtgct 600
tacttggaact tctacgtggt gttcagccag ccgacatgca acgttctcag agtccgagaa 660
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gatgacaacg ataacacgga atcgctgaag aactattggg aaagaagaat aaataatact 780
aaaacaagat ttcgacataa tactaagaaa tgtaagatgt acgtacaacg ttattcaatt 840
gagaaggctg aagatgtctt taaaaacact gcttttaaac acctcccctc cgactgccgc 900
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aatagctccc tgccagctaa tatggcagaa agttaaatga gctatttcac ttcattgttc 1020
accgtatgcc tggatgcaa gaaggtgagg ttggacagga tacttccgaa ttattttttc 1080
agtctgcctt gtacgcacga aataacaaaa tatctgttga agccnncaac nnnnnnaana 1140
anaaaaaana aaaaaa 1156

```

```

<210> 23
<211> 26
<212> DNA
<213> Artificial Sequence

```

```

<220>
<223> Description of Artificial Sequence: reverse
transcriptase polymerase primer

```

```

<400> 23
aaygngarc aycargaygc ntggaa

```

26

```

<210> 24
<211> 26
<212> DNA
<213> Artificial Sequence

```

```

<220>
<223> Description of Artificial Sequence: reverse
transcriptase polymerase primer

```

<400> 24
ktrtmrtcng tnryccanar ytcrt

26

<210> 25
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Tagging
sequence

<400> 25
tatatgatca gaaaacccgc tctggg

26

<210> 26
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: tagging
sequence

<400> 26
tatactcgag ccagggttcg ccgt

24

<210> 27
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: amplifying
oligonucleotide

<400> 27
tatgaagatg caggtagtgc

20

<210> 28
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: amplifying
oligonucleotide

<400> 28
atatgatcag ccagggttcg ccgt

24

<210> 29
<211> 27
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward primer

<400> 29

tatgagctca tgaactctgc cttgtgg

27

<210> 30

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse primer

<400> 30

tatggatccg ggggtggcctc accg

24

<210> 31

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Suggested
octapeptide

<400> 31

Ala Glu Ala Phe Ala Glu Ala Trp

1

5